

UNIVERSITY OF FORT HARE

**AMB 121L**

DEGREE EXAMINATIONS  
November 2019

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Time: 3 HOURS

Subject: Business Mathematics

Marks: 100

This question paper consists of 4 pages

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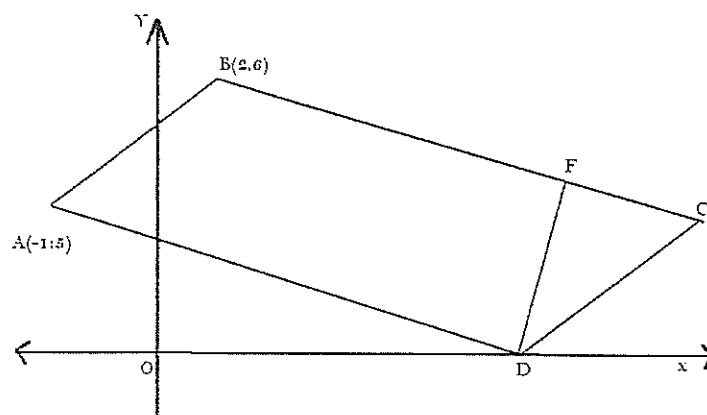
Instructions

Answer all questions.  
Symbols have the usual meanings

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Question 1

- 1.1 In  $\triangle ABC$ ,  $BC = 8$  cm and  $CD = 4$  cm, is drawn perpendicular to  $AB$  and  $AC = 5$  cm. Compute, (i) the area and (ii) the perimeter of  $\triangle ABC$ . Hint: First draw the triangle. (5)
- 1.2 A given circle has a perimeter of  $24\pi$  cm. Find its (i) radius and (ii) area. (5)
- 1.3 In the diagram below, points  $A(-1;5)$ ,  $B(2; 6)$ ,  $C$  and  $D$  are the vertices of a parallelogram  $ABCD$  where  $D$  lies on the  $x$ -axis. The line segment  $BC$  has an equation,  $x + y = 8$ . (i) Find the equation of line  $AD$ , (ii) the coordinates of point  $D$ , (iii) If the coordinates of  $F$  are  $(4; 4)$ , show that  $BC$  is perpendicular to  $DF$ . (iv) Calculate the length of  $AD$  &  $DF$  the height of triangle  $DFC$ . (v) Find the length of  $BC$  then deduce the length of  $CF$ . (3, 2, 3, 4, 3)



[25]

Question 2

- 2.1 Without the use of a calculator, evaluate  $\frac{\cos 30^\circ + \sin 60^\circ}{\tan 60^\circ}$ . (3)
- 2.2 If  $\theta$  is acute, and  $\sin \theta = \frac{5}{13}$ , find (i)  $\cos \theta$ ; (ii)  $\sin 2\theta$ ; (iii)  $\cos 2\theta$ ; (iv)  $\frac{\operatorname{cosec} \theta - \cot \theta}{\tan \theta}$  (7)
- 2.3 Find the general solution of the following trigonometric equation,  $2 \sin 3x = \sqrt{3}$  without using a calculator. (4)
- 2.4 Consider the function  $y = \cos 3x$  and find its (i) amplitude (ii) period then (iii) draw its graph. (5)
- 2.5 A farmer has 100 metres of fencing wire from which he wishes to build a chicken run. This farmer intends using two existing adjacent walls for two sides of the intended rectangular enclosure. Find the dimensions which give maximum enclosed area. (6)

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Question 3

3.1 If  $f(x) = -\frac{2}{x}$  find the limit,  $\lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ . (4)

3.2 Find  $\frac{dy}{dx}$ , (i) the slope of tangent line to the curve  $y = 3x^2 - 2x + 1$  at  $x = 1$ .  
 (ii) The equations of both the tangent and normal lines. (6)

3.3 A car factory makes two models: automatic & manual. It takes 8 hrs to make an automatic and 4 hrs to make a manual one and the factory can work for a maximum of 72 hrs/week. To cover costs, at least 10 cars must be made weekly. The profit on an automatic model is R500 and on a manual R200.

- 3.3.1 Draw a table that models the information given above, (2)
- 3.3.2 From the above table, list down the four constraints, (4)
- 3.3.3 What is the objective function of this problem? (1)
- 3.3.4 Represent your constraints in a graph then showing the feasible region. (4)
- 3.3.5 What are the corner points of your feasible region? (4)
- 3.3.6 How many of each model should be made weekly for a maximum profit and what is the maximum profit? (2)

[25]

Question 4

4.1 Consider the following matrices, and answer the questions that follow;

$$A = \begin{bmatrix} 2 & -3 & 1 \\ -1 & 4 & 2 \\ 2 & -1 & 3 \end{bmatrix} \quad B = \begin{bmatrix} 2 & -1 & -2 \\ -1 & 2 & 1 \\ 1 & 0 & -3 \end{bmatrix} \quad C = \begin{bmatrix} 3 & 1 & -1 & -2 \\ -2 & 5 & 4 & 3 \\ 1 & 2 & 3 & 1 \end{bmatrix} \quad D = \begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$$

- 4.1.1 From the above matrices, state the size of matrix C. (1)
- 4.1.2 Which of the above matrices is/are not square matrices? (1)
- 4.1.3 It is not possible to get A+C, give a reason why is this so? (1)
- 4.1.4 Find  $2A - B$  (3)
- 4.1.5 Find AC. (5)
- 4.1.6 Find the transpose of C. (2)
- 4.1.7 Find the Determinant of B. (4)

4.2 Use the Cramer's rule to the following system of equations; (8)

$$\begin{aligned} 2x + y - z &= 2 \\ x - y + z &= 7 \\ 2x + 2y + z &= 4 \end{aligned} \quad [25]$$

THE END